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7U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

National Institute of Justice

Law Enforcement and Corrections Standards and Testing Program

Guide for the Selection of Personal Protective Equipment for Emergency First Responders (Respiratory Protection)

NIJ Guide 102–00

Volume IIa

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ABOUT THE LAW ENFORCEMENT AND CORRECTIONS STANDARDS AND TESTING PROGRAM

The Law Enforcement and Corrections Standards and Testing Program is sponsored by the Office of Science and Technology of the National Institute of Justice (NIJ), U.S. Department of Justice. The program responds to the mandate of the Justice System Improvement Act of 1979, which created NIJ and directed it to encourage research and development to improve the criminal justice system and to disseminate the results to Federal, State, and local agencies.

The Law Enforcement and Corrections Standards and Testing Program is an applied research effort that determines the technological needs of justice system agencies, sets minimum performance standards for specific devices, tests commercially available equipment against those standards, and disseminates the standards and the test results to criminal justice agencies nationally and internationally.

The program operates through:

The *Law Enforcement and Corrections Technology Advisory Council* (LECTAC) consisting of nationally recognized criminal justice practitioners from Federal, State, and local agencies, which assesses technological needs and sets priorities for research programs and items to be evaluated and tested.

The *Office of Law Enforcement Standards* (OLES) at the National Institute of Standards and Technology, which develops voluntary national performance standards for compliance testing to ensure that individual items of equipment are suitable for use by criminal justice agencies. The standards are based upon laboratory testing and evaluation of representative samples of each item of equipment to determine the key attributes, develop test methods, and establish minimum performance requirements for each essential attribute. In addition to the highly technical standards, OLES also produces technical reports and user guidelines that explain in nontechnical terms the capabilities of available equipment.

The *National Law Enforcement and Corrections Technology Center (NLECTC)*, operated by a grantee, which supervises a national compliance testing program conducted by independent laboratories. The standards developed by OLES serve as performance benchmarks against which commercial equipment is measured. The facilities, personnel, and testing capabilities of the independent laboratories are evaluated by OLES prior to testing each item of equipment, and OLES helps the NLECTC staff review and analyze data. Test results are published in Equipment Performance Reports designed to help justice system procurement officials make informed purchasing decisions.

Publications are available at no charge through the National Law Enforcement and Corrections Technology Center. Some documents are also available online through the Internet/World Wide Web. To request a document or additional information, call 800–248–2742 or 301–519–5060, or write:

National Law Enforcement and Corrections Technology Center
P.O. Box 1160
Rockville, MD 20849–1160
E-Mail: *asknlectc@nlectc.org*
World Wide Web address: *http://www.nlectc.org*

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Guide for the Selection of Personal Protective Equipment for Emergency First Responders (Respiratory Protection)

NIJ Guide 102–00, Volume IIa

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NCJ ######

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National Institute of Justice

Sarah V. Hart
Director

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This guide was prepared by the Office of Law Enforcement
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sponsored by the National Institute of Justice (NIJ).

FOREWORD

The Office of Law Enforcement Standards (OLES) of the National Institute of Standards and Technology (NIST) furnishes technical support to the National Institute of Justice (NIJ) program to support law enforcement and criminal justice in the United States. The function of OLES is to develop standards and conduct research that will assist law enforcement and criminal justice agencies in the selection and procurement of quality equipment.

OLES is: (1) subjecting existing equipment to laboratory testing and evaluation, and (2) conducting research leading to the development of several series of documents, including national standards, user guides, and technical reports.

This document covers research conducted by OLES under the sponsorship of NIJ. Additional reports as well as other documents are being issued under the OLES program in the areas of protective clothing and equipment, communications systems, emergency equipment, investigative aids, security systems, vehicles, weapons, and analytical techniques and standard reference materials used by the forensic community.

Technical comments and suggestions concerning this guide are invited from all interested parties. They may be addressed to the Office of Law Enforcement Standards, National Institute of Standards and Technology, 100 Bureau Drive, Stop 8102, Gaithersburg, MD 20899–8102.

Sarah V. Hart, Director
National Institute of Justice

Acknowledgments

We thank Ms. Kathleen Higgins and Dr. Alim Fatah of the National Institute of Standards and Technology (NIST) for programmatic support and for numerous valuable discussions concerning the contents of this document. Mr. Bill Haskell of the U.S. Army Soldier and Biological Chemical Command (SBCCOM), Mr. Richard Vigus of SBCCOM, Ms. Priscilla S. Golden of General Physics, and Mr. Todd Brethauer representing the Technical Support Working Group (TSWG)[3] also reviewed the document and provided numerous useful comments. In addition, the authors want to acknowledge and thank the emergency first responders who reviewed the document and responded with positive and helpful comments.

We wish to acknowledge the Personal Protection and Operational Equipment (PPE) subgroup of the InterAgency Board (IAB) for Equipment Standardization and InterOperability. The IAB (made up of government and first responder representatives) was commissioned by the Attorney General of the United States in conjunction with the Department of Defense's Director of Military Support. The IAB was established to ensure equipment standardization and interoperability and to oversee the research and development of advanced technologies to assist first responders at the State and local levels in establishing and maintaining a robust crisis and consequence management capability.[4]

We also sincerely thank all vendors who provided us with information about their products.

[3]The Technical Support Working Group (TSWG) is the U.S. national forum that identifies, prioritizes, and coordinates interagency and international research and development (R&D) requirements for combating terrorism. Through the Department of Defense's Combating Terrorism Technology Support Program and funding provided by other agencies, the TSWG rapidly develops technologies and equipment to meet the high-priority needs of the combating terrorism community, and addresses joint international operational requirements through cooperative R&D with major allies.

[4]The Marshall Convention, Standardized Weapons of Mass Destruction (WMD) Response Force Equipment and InterOperability, 2 to 4 November 1999.

CONTENTS

COMMONLY USED SYMBOLS AND ABBREVIATIONS

A	ampere	h	hour	oz.	ounce
ac	alternating current	hf	high frequency	No.	number
AM	amplitude modulation	Hz	hertz	o.d.	outside diameter
cd	candela	i.d.	inside diameter	Ω	ohm
cm	centimeter	in	inch	p.	page
CP	chemically pure	IR	infrared	Pa	pascal
c/s	cycle per second	J	joule	pe	probable error
d	day	L	lambert	pp.	pages
dB	decibel	L	liter	ppm	parts per million
dc	direct current	lb	pound	qt	quart
°C	degree Celsius	lbf	pound-force	rad	radian
°F	degree Fahrenheit	lbf·in	pound-force inch	rf	radio frequency
dia	diameter	lm	lumen	rh	relative humidity
emf	electromotive force	ln	logarithm (base e)	s	second
eq	equation	log	logarithm (base 10)	SD	standard deviation
F	farad	M	molar	sec.	Section
fc	footcandle	m	meter	SWR	standing wave ratio
fig.	Figure	μ	micron	uhf	ultrahigh frequency
FM	frequency modulation	min	minute	UV	ultraviolet
ft	foot	mm	millimeter	V	volt
ft/s	foot per second	mph	miles per hour	vhf	very high frequency
g	acceleration	m/s	meter per second	W	watt
g	gram	mo	month	λ	wavelength
gal	gallon	N	newton	wk	week
gr	grain	N·m	newton meter	wt	weight
H	henry	nm	nanometer	yr	year

area=unit^2 (e.g., ft^2, in^2, etc.); volume=unit^3 (e.g., ft^3, m^3, etc.)

ACRONYMS SPECIFIC TO THIS DOCUMENT

ASTM	American Society for Testing and Materials	NFPA	National Fire Protection Association
BW	Biological Warfare	NIJ	National Institute of Justice
CB	Chemical and Biological	NIOSH	National Institute for Occupational Safety and Health
CBW	Chemical Biological Warfare	NIST	National Institute of Standards and Technology
CPU	Collective Protective Undergarment	NATO	North Atlantic Treaty Organization
CW	Chemical Warfare	NBC	Nuclear, Biological, and Chemical
DOD	Department of Defense	OSHA	Occupational Safety and Health Administration
DPG	Dugway Proving Grounds	PAPR	Powered Air Purifying Respirator
DRES	Defense Research Establishment Suffield	PF	Protection Factor
ECBE	Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD	POL	Petroleum, Oils, and Lubricants
EOD	Explosive Ordnance Disposal	PPE	Personal Protection Equipment
EPA	Environmental Protection Agency	PPV	Positive Pressure Ventilation
ERDEC	U.S. Army Edgewood Research, Development and Engineering Center	PVC	Polyvinyl chloride
FBI	Federal Bureau of Investigation	SBCCOM	U.S. Army Soldier and Biological Chemical Command
FR	Fire Resistant	SCBA	Self-Contained Breathing Apparatus
HAZMAT	Hazardous Materials	SCFM	Standard Cubic Feet per Minute
IDLH	Immediately Dangerous to Life and Health	TAP	Toxicological Agent Protective
IAB	Interagency Board	TICs	Toxic Industrial Chemicals
IDLH	Immediately Dangerous to Life and Health	TIMs	Toxic Industrial Materials
IAB	Interagency Board	TOP	Test Operating Procedure
ITAR	International Traffic and Arms Regulations	TSWG	Technical Support Working Group

PREFIXES (See ASTM E380)

d	deci (10^{-1})	da	deka (10)
c	centi (10^{-2})	h	hecto (10^{2})
m	milli (10^{-3})	k	kilo (10^{3})
µ	micro (10^{-6})	M	mega (10^{6})
n	nano (10^{-9})	G	giga (10^{9})
p	pico (10^{-12})	T	tera (10^{12})

COMMON CONVERSIONS

0.30480 m =1 ft	4.448222 N = 1 lbf
25.4 mm = 1 in	1.355818 J = 1 ft·lbf
0.4535924 kg = 1 lb	0.1129848 N m = 1 lbf·in
0.06479891g = 1gr	14.59390 N/m = 1 lbf/ft
0.9463529 L = 1 qt	6894.757 Pa = 1 lbf/in^2
3600000 J = 1 kW·hr	1.609344 km/h = 1 mph

psi = mm of Hg x (1.9339×10^{-2})

mm of Hg = psi x 51.71

Temperature: $T\,{}^{\circ}_{C} = (T\,{}^{\circ}_{F} - 32) \times 5/9$

Temperature: $T\,{}^{\circ}_{F} = (T\,{}^{\circ}_{C} \times 9/5) + 32$

EXECUTIVE SUMMARY

The National Institute of Justice is the focal point for providing support to State and local law enforcement agencies in the development of counterterrorism technology and standards, including technology needs for chemical and biological defense. In recognizing the needs of State and local emergency first responders, the Office of Law Enforcement Standards (OLES) at the National Institute of Standards and Technology (NIST), supported by the National Institute of Justice (NIJ), the Technical Support Working Group (TSWG), the U.S. Army Soldier and Biological Chemical Command, and the Interagency Board for Equipment Standardization and Interoperability (IAB), is developing chemical and biological defense equipment guides. The guides will focus on chemical and biological equipment in areas of detection, personal protection, decontamination, and communication. This document focuses specifically on assisting the emergency first responder community in the evaluation and purchase of personal protective equipment.

The long range plans are to: (1) subject existing personal protective equipment to laboratory testing and evaluation against a specified protocol, and (2) conduct research leading to the development of multiple series of documents, including national standards, user guides, and technical reports. It is anticipated that the testing, evaluation, and research processes will take several years to complete; therefore, the National Institute of Justice has developed this initial guide for the emergency first responder community in order to facilitate their evaluation and purchase of personal protective equipment.

In conjunction with this program, additional guides, as well as other documents, are being issued in the areas of chemical agent and toxic industrial material detection equipment, biological agent detection equipment, decontamination equipment, and communication equipment.

This Volume, IIa, of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders*, which focuses particularly on respiratory protection. It contains the information data sheets that were used to support the personal protective equipment evaluation detailed in Volume I. The compilation of data in Volume IIa is the result of the merger of several data acquisition methods used independently by NIST and TSWG.

The information contained in this guide has been obtained through literature searches and market surveys. The vendors were contacted multiple times during the preparation of this guide to ensure data accuracy. In addition, the information is supplemented with test data obtained from other sources (e.g., Department of Defense), if available. It should also be noted that the purpose of this guide is not to provide recommendations but rather to serve as a means to provide information to the reader to compare and contrast commercially available personal protective equipment. *Reference herein to any specific commercial products, processes, or services by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government. The information and statements contained in this guide shall not be used for the purposes of advertising, nor to imply the endorsement or recommendation of the United States Government.*

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With respect to information provided in this guide, neither the United States Government nor any of its employees make any warranty, expressed or implied, including but not limited to the warranties of merchantability and fitness for a particular purpose. Further, neither the United States Government nor any of its employees assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed.

Technical comments, suggestions, and product updates are encouraged from interested parties. They may be addressed to the Office of Law Enforcement Standards, National Institute of Standards and Technology, 100 Bureau Drive, Stop 8102, Gaithersburg, MD 20899–8102. It is anticipated that this guide will be updated periodically.

Questions relating to the specific devices included in this document should be addressed directly to the proponent agencies or the equipment manufacturers. Contact information for each equipment item included in this guide can be found in this volume (Vol. IIa).

WORKING DRAFT

GUIDE FOR THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT FOR EMERGENCY FIRST RESPONDERS (RESPIRATORY PROTECTION)

This guide includes information intended to be useful to the emergency first responder community in the selection of personal protective equipment (PPE) that includes chemical and biological protective clothing and respiratory equipment for different applications. This Volume, IIa, of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders*, includes details on the 69 respiratory protective items referenced in Volume I.

1. INTRODUCTION

The *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* includes information intended to be useful to the emergency first responder community in the selection of PPE. Due to the large number of personal protective equipment items identified for the guide, the guide is separated into four volumes. Volume I serves as the selection tool for all PPE items while Volume IIa serves as a repository for the respiratory PPE data sheets; Volume IIb serves as a repository for the percutaneous (garments) PPE data sheets; and Volume IIc serves as a repository for the percutaneous (apparel other than garments) PPE data sheets.

2. IDENTIFICATION OF PERSONAL PROTECTION EQUIPMENT

An extensive market survey was conducted to identify commercially available personal protective equipment. This market survey encompassed the assessment of past market surveys, identification of new equipment, and interaction with numerous equipment vendors.

2.1 Identification of New Equipment

A variety of sources were utilized to identify commercially available personal protective equipment, including a Commerce Business Daily (CBD) Announcement, literature searches, database searches, Internet searches, technical conferences, and technical contacts. These sources resulted in the identification of 69 respiratory protective equipment items.

2.2 Vendor Contact

Vendors were contacted two separate times in order to obtain additional product information, as well as to finalize their specific equipment data for inclusion in the guide. An initial contact occurred in the Fall of 1999, at the Ninth International Society for Respiratory Protection (ISRP) Conference held in Pittsburgh, Pennsylvania, where the manufacturers and vendors supplied detailed information about their products.

The second contact was made during March 2001. Each vendor again received a facsimile or an electronic mail message that contained the data sheets for their specific equipment item(s), the selection factors that were developed to assist with the selection and purchase of the most appropriate equipment, and the results of the evaluation of the respiratory protective equipment against the selection factors. The vendors were asked to review the data sheets and tables for completeness and accuracy of the incorporated data.

3. DATA FIELDS

Appendix E serves as a compendium of commercially available personal protective equipment. Each of the 69 identified respiratory protection equipment items is detailed within appendix E. Forty-nine data fields, as defined in this section, were used for providing information relating to the personal protective equipment. It is important to note that these data fields were developed using input from the emergency responder community.

The data fields are organized into the following five categories:

- General.
- Operational Parameters.
- Physical Parameters.
- Logistical.
- Special Requirements.

The remainder of this section defines each of the 49 data fields by category.

3.1 General Category

The General category includes the following data fields:

1. Name.
2. ID #.
3. Technology.
4. Stock Number.
5. Protection Type.
6. Equipment Category.
7. Availability.
8. Current User.
9. Manufacturer.
10. Manufacturer Type.
11. Developer.
12. Source.
13. Certification.

Each of these data fields is defined in more detail in the remainder of this section.

3.1.1 Name

The Name data field is used to identify the name of the equipment.

3.1.2 ID

The ID # data field is for identification purposes only.

3.1.3 Technology

The Technology data field identifies the processes used to protect the wearer from chemical (CW agents and TIMs), biological agents, and nuclear particulates. Respiratory protection is supplied by physical separation of the agent from the incoming air (i.e., adsorption, condensation), reactive separation (i.e., catalytic oxidation, biofiltration, reactive membranes), or particle separation (i.e., scrubbers, electrostatic precipitation).

3.1.4 Stock Number

The Stock Number data field includes the stock identification or national stock number, if the item has one.

3.1.5 Protection Type

The Protection Type data field identifies whether the equipment provides percutaneous (skin) and/or respiratory protection.

3.1.6 Equipment Category

The Equipment Category data field identifies if the equipment is SCBA, PAPR, tethered air, canister, etc.

3.1.7 Availability

The Availability data field refers to how readily available a piece of equipment is (e.g., how long it takes to receive equipment upon purchasing) or availability status of the equipment (e.g., commercial availability).

3.1.8 Current User

The Current User data field is used to identify organizations that are currently using the piece of equipment.

3.1.9 Manufacturer

The Manufacturer data field indentifies the company that manufactured the piece of equipment (to include the name, address, telephone number, and point-of-contact).

3.1.10 Manufacturer Type

The Manufacturer Type data field indicates whether the manufacturer is domestic or foreign.

3.1.11 Developer

The Developer data field identifies the organization that developed the item. This may be relevant when the developer is the government and the responsible technical agency may need to be identified.

3.1.12 Source

The Source data field indicates where the equipment information was obtained. Potential sources include past market surveys and Internet web sites.

3.1.13 Certification

The Certification data field identifies the agency certifying the system for use (i.e., OSHA, NIOSH, NFPA, etc.), if any.

3.2 Operational Parameters Category

The Operational Parameters category includes the following five data fields:

1. Chemical Warfare (CW) Agents Protection.
2. Biological Warfare (BW) Agents Protection.
3. Toxic Industrial Material (TIMs) Protection.
4. Duration of Protection.
5. Recommended Use(s).

Each of these data fields is defined in more detail in the remainder of this section.

3.2.1 Chemical Warfare (CW) Agents Protection

The Chemical Warfare Agents Protection data field indicates the type of chemical warfare (CW) agent. The most common types of classic CW agents are the nerve and blister agents. Nerve agents include GA (Tabun), GB (Sarin), GD (Soman), GF, and VX. Blister agents include H and HD (Sulfur Mustards), HN (Nitrogen Mustard), and L (Lewisite).

3.2.2 Biological Warfare (BW) Agents Protection

The Biological Warfare (BW) Agents Protection data field indicates the type of biological warfare (BW) agent. Classical BW agents include bacteria (Anthrax), rickettsia (Typhus), toxins (Botulinum Toxin), and viruses (Q Fever).

3.2.3 Toxic Industrial Materials (TIMs) Protection

The Toxic Industrial Materials (TIMs) Protection data field indicates the type of TIM agent. TIMs are used in a variety of settings such as manufacturing facilities, maintenance areas, and storage areas. TIMs are further characterized by using a high, medium, or low hazard index.

Examples of TIMs are ammonia, carbon monoxide, chlorine, hydrogen cyanide, phosgene, and mineral acids (e.g., hydrochloric acid, sulfuric acid, and nitric acid).

3.2.4 Duration of Protection

The Duration of Protection data field indicates the amount of time the equipment provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, and environmental conditions, duration will be given with respect to specific conditions.

3.2.5 Recommended Use(s)

The Recommended Use(s) data field idendifies the areas where the equipment is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, and crisis management).

3.3 Physical Parameters Category

The Physical Parameters Category includes the following data fields:

1. Sizes Available.
2. Weight.
3. Package Size and Volume.
4. Power Requirements.
5. Material Type.
6. Construction Type.
7. Color.

Each of these data fields is defined in more detail in the remainder of this section.

3.3.1 Size Available

The Sizes Available data field provides available sizes for an item, to include both male and female when appropriate.

3.3.2 Weight

The Weight data field indicates the total weight of the equipment/system.

3.3.3 Package Size and Volume

The Package Size and Volume data field provides the external dimensions of the system when packaged (for storage and transportability).

3.3.4 Power Requirements

The Power Requirements data field indicates the type of power (ac, dc, etc.) required to operate the equipment. This category applies primarily to respiratory, respiratory support equipment, and heating/cooling systems.

3.3.5 Material Type

The Material Type data field refers to the material content of the respiratory protection apparatus.

3.3.6 Construction Type

The Construction Type data field indicates how the protective apparatus is formed.

3.3.7 Color

The Color data field indicates if equipment has camouflage capability (signature reduction). Color can help identify job type.

3.4 Logistical Parameters Category

The Logistical Parameters Category includes the following data fields:

1. Ease of Use.
2. Consumables.
3. Maintenance Requirements.
4. Shelf Life.
5. Transportability.
6. Operational Limitations.
7. Environmental Conditions.
8. Unit Cost.
9. Maintenance Cost.
10. Warranty.
11. Don/Doff Information.
12. Use/Reuse.
13. Launderability.
14. Accessories.

Each of these data fields is defined in more detail in the remainder of this section.

3.4.1 Ease of Use

Ease of Use is the mobility and flexibility of an individual while wearing the equipment as well as the compatibility of the equipment with other equipment.

3.4.2 Consumables

Consumables are the supplies used during operation and storage. Examples of consumables are batteries, canisters, hoses, etc.

3.4.3 Maintenance Requirements

Maintenance Requirements are the services and parts required to keep the system at its peak operational readiness (e.g., preventative maintenance) and the frequency of required maintenance (e.g., after use, quarterly, and annually).

3.4.4 Shelf Life

Shelf Life is the length of time a piece of equipment can be stored before it needs to be replaced. Shelf life includes the recommended storage procedure and any factors that decrease shelf life (e.g., UV, and critical temperature).

3.4.5 Transportability

Transportability is the ability of the equipment to be transported, including any support equipment (e.g., respiratory equipment and heating/cooling systems).

3.4.6 Operational Limitations

Operational Limitations refer to the length of time responders can safely work at various temperatures (i.e., 50 °F, 70 °F, and 90 °F) and the availability/compatibility of cooling systems to help manage heat stress.

3.4.7 Environmental Conditions

Environmental Conditions indicate whether the equipment is designed for use in all common outdoor weather conditions and climates (e.g., rain, snow, extreme temperatures, and humidity) or only under relatively controlled conditions.

3.4.8 Unit Cost

Unit Cost is the cost of a complete system, including support equipment and operating costs (i.e., consumables).

3.4.9 Maintenance Cost

Maintenance Cost is the cost required to maintain the system at its operational readiness. This cost will be based on equipment usage rates.

3.4.10 Warranty

The Warranty is the length of time a piece of equipment is guaranteed by the manufacturer, including the terms of the warranty (parts and labor).

3.4.11 Don/Doff Information

The Don/Doff Information indicates whether the system requires assistance for donning and/or doffing and the average time for this activity.

3.4.12 Use/Reuse

Use/Reuse indicates the need for any part of the equipment to be discarded after use or its ability to be reused. The data field includes the procedures used to decontaminate and/or dispose of used equipment.

3.4.13 Launderability

Launderability includes the cleaning procedures that are safe for the item, including the number of times the item can be cleaned and remain effective. Also, launderability includes any special procedures needed for specific components.

3.4.14 Accessories

Accessories include those items that are provided with the basic equipment.

3.5 Special Requirements Category

The Special Requirements category includes the following data fields:

1. Training Requirements.
2. Training Available.
3. Manuals Available.
4. Surveillance Testing Requirements.
5. Support Equipment.
6. Testing Information.
7. Applicable Regulations.
8. Health Hazards.
9. Communications Interface Capability.
10. EOD Compatibility.

Each of these data fields is defined in more detail in the remainder of this section.

3.5.1 Training Requirements

The Training Requirements data field refers to the amount of instruction time the operator needs to become proficient in using a piece of equipment.

3.5.2 Training Available

The Training Available data field refers to training available from the manufacturer. This includes any initial training and recertification training that is available.

3.5.3 Manuals Available

The Manuals Available data field indicates the types of manuals available from the manufacturer (e.g., user manuals, and training documentation).

3.5.4 Surveillance Testing Requirements

The Surveillance Testing Requirements data field specifies the testing required to keep a piece of equipment at its operational readiness (e.g., inspecting respiratory masks or suits for holes or tears).

3.5.5 Support Equipment

The Support Equipment data field refers to any additional equipment required to operate the primary unit.

3.5.6 Testing Information

The Testing Information data field includes any test data obtained from the manufacturer and other sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing).

3.5.7 Applicable Regulations

The Applicable Regulations data field includes any government and/or safety regulations that may apply to the possession, use, or storage of any part of the system.

3.5.8 Health Hazards

The Health Hazards data field identifies all materials that possess a potential health hazard.

3.5.9 Communications Interface Capability

The Communications Interface Capability data field refers to the ability of the personal protective equipment to interface with a communications system (network capability, hardwire capability, and RF communication).

3.5.10 EOD Compatibility

The EOD Compatibility data field is the ability of the equipment to be used with EOD systems (i.e., suits). For example, a CB protective suit and respirator are required to be worn with an EOD suit in a CB environment.

APPENDIX A—REFERENCES

APPENDIX A—REFERENCES

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APPENDIX B—INDEX BY RESPIRATORY PROTECTIVE EQUIPMENT IDENTIFICATION NUMBER

Index by Respiratory Protective Equipment Identification Number

ID #	Respiratory PPE Name	Manufacturer	Page E–#
26	M42 Series Gas Mask	ILC Dover, Inc.	61
27	ARAP/C and ARAP/E Airline Respirators	International Safety Instruments	64
28	Viking Digital SCBA	International Safety Instruments	66
29	Interspiro Spiroscape Escape BA	Interspiro Group	68
30	Interspiro Respirator	Interspiro Group	71
31	C4 Gas Mask	Irvin Aerospace Canada Limited	73
32	Litpac II-Rebreather	Litton Life Support	75
33	Easiflow Plus Full Facemask Respirator and Filters	Martindale Centurion Safety Products Ltd.	79
34	Magnum 4000 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	81
35	Magnum 4500 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	83
36	Magnum 8000 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	85
37	Magnum 8500 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	87
38	9 mtr Unpowered Fresh-Air Hose System	Martindale Centurion Safety Products Ltd.	89
39	M95 Respirator NBC Protective Respirator	Micronel Safety	91
40	MSA Advantage 1000 CBA/RCA Full-Face Respirator	MSA	94
41	MSA Advantage 1000 with GME-P100 Cartridges	MSA	97
42	MSA Millennium Chemical-Biological Mask	MSA	100
43	MSA OptimAir® MM 2K PAPR	MSA	103
44	MSA OptimAir* 6A PAPR with OptiFilter Cartridges	MSA	106
45	MSA Phalanx CBA/RCA Gas Mask	MSA	109
46	MSA PremAire™ XV Supplied Air Respirator	MSA	112
47	MSA RescueAire™ II Portable Air-Supply System	MSA	114
48	MSA Ultra-Twin® Respirators	MSA	117
49	MSA MCU-2/P and MCU-2A/P Series	MSA	120
50	MSA MMR Xtreme® Air Mask	MSA	123
51	3M™ Breathe Easy™ Powered Air Purifying Respirator System	3M	126

ID #	*Respiratory PPE Name*	*Manufacturer*	*Page E–#*
52	3M™ Breathe Easy™ Powered Air Purifying Respirator System	3M	129
53	3M™ 5000 Series Full Facepiece Respirators	3M	132
54	3M™ 6000 Series Full Facepiece Respirator	3M	134
55	3M™ 7800S-BA Full Facepiece Respirators	3M	136
56	3M™ SCBAG Self-Contained Breathing Apparatus	3M	138
57	3M™ Belt-Mounted PAPR	3M	141
58	3M™ GVP Belt-Mounted Powered Air Purifying Respirator	3M	143
59	3M™ Escort Combination ESCBA/Supplied Air Respirator	3M	145
60	3M™ Full Facepiece FR-M40	3M	147
61	Scott AV 2000 AV-2000® Facepiece	Scott Health and Safety	150
62	Scott C420 Variflo™ PAPR	Scott Health and Safety	152
63	PAN1 Dual Cartridge Full Face Respirator	Shalon Chemical Industries Ltd., Israel	154
64	PAN2 Single Filter Canister	Shalon Chemical Industries Ltd., Israel	157
65	Model 4A1 NBC Respirator	Shalon Chemical Industries Ltd., Israel	160
66	M15-A30 NBC Respirator	Shalon Chemical Industries Ltd., Israel	163
67	SE400 Fan Supplied, Positive Pressure Respirator (FPBR)	SEA	166
68	Survivair™ Cougar SCBA	Survivair	169
69	Survivair™ Belt Mounted PAPR	Survivair	172

APPENDIX C—INDEX BY RESPIRATORY PROTECTIVE EQUIPMENT NAME

Index by Respiratory Protective Equipment Name

Respiratory PPE Name	*Manufacturer*	*ID #*	*Page E–#*
Easiflow Plus Full Facemask Respirator and Filters	Martindale Centurion Safety Products Ltd.	33	79
EVATOX Adult Escape Hood US	GIAT Industries, France	24	56
Interspiro Respirator	Interspiro Group	30	71
Interspiro Spiroscape Escape BA	Interspiro Group	29	68
Kareta M Mask	Draeger Safety, Inc.	20	47
Litpac II-Rebreather	Litton Life Support	32	75
M15-A30 NBC Respirator	Shalon Chemical Industries Ltd., Israel	66	163
M40 Series Gas Mask	ILC Dover, Inc.	25	58
M42 Series Gas Mask	ILC Dover, Inc.	26	61
M95 Respirator NBC Protective Respirator	Micronel Safety	39	91
Magnum 4000 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	34	81
Magnum 4500 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	35	83
Magnum 8000 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	36	85
Magnum 8500 P3, with Full Facemask	Martindale Centurion Safety Products Ltd.	37	87
Model 4A1 NBC Respirator (69)	Shalon Chemical Industries Ltd., Israel	65	160
MSA Advantage 1000 CBA/RCA Full-Face Respirator	MSA	40	94
MSA Advantage 1000 with GME-P100 Cartridges	MSA	41	97
MSA MCU-2/P and MCU-2A/P Series	MSA	49	120
MSA Millennium Chemical-Biological Mask	MSA	42	100
MSA MMR Xtreme® Air Mask	MSA	50	123
MSA OptimAir* 6A PAPR with OptiFilter Cartridges	MSA	44	106
MSA OptimAir® MM 2K PAPR	MSA	43	103
MSA Phalanx CBA/RCA Gas Mask	MSA	45	109
MSA PremAire™ XV Supplied Air Respirator	MSA	46	112
MSA RescueAire™ II Portable Air-Supply System	MSA	47	114
MSA Ultra-Twin® Respirators	MSA	48	117

Respiratory PPE Name	*Manufacturer*	*ID #*	*Page E–#*
NBC CoolAir SCBA	Aerospace Design and Development	5	11
NBC FM12 Respirator	Avon Technical Products Protection Group	2	3
NBC SF10 Respirator	Avon Technical Products Protection Group	3	6
PAN1 Dual Cartridge Full Face Respirator	Shalon Chemical Industries Ltd., Israel	63	154
PAN2 Single Filter Canister	Shalon Chemical Industries Ltd., Israel	64	157
Panorama Nova Full Facepiece	Draeger Safety, Inc.	18	43
Parat NBC Escape Hood	Draeger Safety, Inc.	19	45
PAPR System	GIAT Industries, France	23	54
PP mask with ABP3/US canister	GIAT Industries, France	22	52
ProAir Evolution	Draeger Safety, Inc.	17	40
Sabre Tornado® Respiratory System (Airline)	Bullard	11	26
Sabre Tornado® Respiratory System (PAPR)	Bullard	12	28
Scott AV 2000 AV-2000® Facepiece	Scott Health and Safety	61	150
Scott C420 Variflo™ PAPR	Scott Health and Safety	62	152
SE400 Fan Supplied, Positive Pressure Respirator (FPBR)	SEA	67	166
SR-100, 60 Minute ESCBA	CSE Corporation	13	30
SuperCritical Air Mobility Pack (SCAMP®) Self Contained Breathing Apparatus (SCBA)	Aerospace Design and Development	6	13
Survivair™ Belt Mounted PAPR	Survivair	69	172
Survivair™ Cougar SCBA	Survivair	68	169
Viking Digital SCBA	International Safety Instruments	28	66

APPENDIX D—INDEX BY RESPIRATORY PROTECTIVE EQUIPMENT MANUFACTURER

Index by Respiratory Protective Equipment Manufacturer

Manufacturer	*Respiratory PPE Name*	*ID #*	*Page E–#*
	(PAPR)		
CSE Corporation	SR-100, 60 Minute ESCBA	13	30
Draeger Safety, Inc.	AirBoss PSS100 with Flashing Gauge or with Sentinel	14	32
Draeger Safety, Inc.	AirBoss Evolution with Flashing Gauge or with Sentinal	15	35
Draeger Safety, Inc.	BG-4 w/Mask	16	38
Draeger Safety, Inc.	ProAir Evolution	17	40
Draeger Safety, Inc.	Panorama Nova Full Facepiece	18	43
Draeger Safety, Inc.	Parat NBC Escape Hood	19	45
Draeger Safety, Inc.	Kareta M Mask	20	47
Duram Rubber Products, Israel	Duram Emergency Escape Respirator	21	49
GIAT Industries, France	EVATOX Adult Escape Hood US	24	56
GIAT Industries, France	PAPR System	23	54
GIAT Industries, France	PP Mask with ABP3/US Canister	22	52
ILC Dover, Inc.	M40 Series Gas Mask	25	58
ILC Dover, Inc.	M42 Series Gas Mask	26	61
International Safety Instruments	ARAP/C and ARAP/E Airline Respirators	27	64
International Safety Instruments	Viking Digital SCBA	28	66
Interspiro Group	Interspiro Spiroscape Escape BA	29	68
Interspiro Group	Interspiro Respirator	30	71
Irvin Aerospace Canada Ltd.	C4 Gas Mask	31	73
Litton Life Support	Litpac II-Rebreather	32	75
Martindale Centurion Safety Products Ltd.	Easiflow Plus Full Facemask Respirator and Filters	33	79
Martindale Centurion Safety Products Ltd.	Magnum 4000 P3, with Full Facemask	34	81
Martindale Centurion Safety Products Ltd.	Magnum 4500 P3, with Full Facemask	35	83
Martindale Centurion Safety Products Ltd.	Magnum 8000 P3, with Full Facemask	36	85
Martindale Centurion Safety Products Ltd.	9 mtr Unpowered Fresh-Air Hose System	38	89
Martindale Centurion Safety Products Ltd.	Magnum 8500 P3, with Full Facemask	37	87
Micronel Safety	M95 Respirator NBC Protective Respirator	39	91
MSA	MSA Advantage 1000 CBA/RCA Full-Face Respirator	40	94
MSA	MSA Advantage 1000 with GME-P100 Cartridges	41	97
MSA	MSA Millennium Chemical-Biological	42	100

Manufacturer	*Respiratory PPE Name*	*ID #*	*Page E–#*
	Mask		
MSA	MSA OptimAir® MM 2K PAPR	43	103
MSA	MSA OptimAir* 6A PAPR with OptiFilter Cartridges	44	106
MSA	MSA Phalanx CBA/RCA Gas Mask	45	109
MSA	MSA PremAire™ XV Supplied Air Respirator	46	112
MSA	MSA RescueAire™ II Portable Air-Supply System	47	114
MSA	MSA Ultra-Twin® Respirators	48	117
MSA	MSA MCU-2/P and MCU-2A/P Series	49	120
MSA	MSA MMR Xtreme® Air Mask	50	123
Scott Health & Safety	Scott AV 2000 AV-2000® Facepiece	61	150
Scott Health & Safety	Scott C420 Variflo™ PAPR	62	152
SEA	SE400 Fan Supplied, Positive Pressure Respirator (FPBR)	67	166
Shalon Chemical Industries Ltd., Israel	PAN1 Dual Cartridge Full Face Respirator	63	154
Shalon Chemical Industries Ltd., Israel	PAN2 Single Filter Canister	64	157
Shalon Chemical Industries Ltd., Israel	Model 4A1 NBC Respirator (69)	65	160
Shalon Chemical Industries Ltd., Israel	M15-A30 NBC Respirator	66	163

WORKING DRAFT

APPENDIX E—RESPIRATORY PROTECTIVE EQUIPMENT DATA SHEETS

CLICK TO VIEW SEPARATE FILES: Pp. 1–39, Pp. 40-80, Pp. 81-125, Pp. 126-174